

Introduction

“Composing is like painting—time is your canvas and sound your palette....”

Keeril Makan’s composition teacher

Why *Time*? or Do fish have a word for *Water*?

We live in an inescapable ocean of time that is defined for us by Nature, our bodies, institutions, devices, and our arts. Our concepts of what time is, can be, should or will be, have always changed with knowledge, necessity, age, and imagination. Since we experience time on myriad levels all at the same time, it is no surprise to find it the subject and substance of our everyday conversations, and of our specialized arts.

Our three-concert Winter Festival and Forums series sets out to place our vast experience with time in the service of encountering the new and unfamiliar in music, much of it by prominent Americans. Music is after all one of the time-arts, like theater and film, which use or manipulate our perceptions of the passage of time to shape and convey a message, and give it meaning as announcement, disclosure, revelation, or memory.

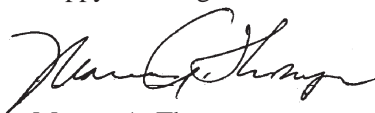
“We acquire a true knowledge only of things that we are obliged to re-create by thought, things that are hidden from us in everyday life.” Marcel Proust

Each of the pieces selected for this festival shares conscious references to musical time itself—as a shaper, as a vehicle for specific recollection or memory within itself or from another time, and as a means of transferring to music the memory, message, or spirit of another artistic medium.

We are fortunate to have three panels of guests who will reflect on these connections and issues in some of the works we will hear and in their own study of time. Among them are Physicist Robert Jaffe (who has written on time on the scale of the Cosmos), Libby Larsen (whose piece is inspired by six paintings of O’Keeffe that encode the passage of time), Peter Child (on creating music to accompany a black and white film), Deborah Stein (on memory in music), Lewis Lockwood (on the invention of the metronome to mark time), and sculptor Paul Matisse (whose public sculpture marks time with sound.)

Hopefully, our preoccupation with time, even on as common a level as toe-tapping, will enhance and not preclude the many other ways of enjoying the artists and the music of the evening.

Happy listening.



Marcus A. Thompson

Living in Musical Time

Michael Scott Cuthbert (MIT)

When the Boston Chamber Music Society's directors decided that their Winter Festival forums and concerts would start at 4 and 8 o'clock respectively, they took control of its timing out of the last-minute whims of the performers, speakers, and audience and put it instead in the hands of an mechanical device. This tradeoff has huge advantages, to be sure. Without a centralized notion of when the concert would start, we could not plan our travel times, have dinner between events, or tell the babysitter when to expect us back. "Clock time" unaffected by human feelings is so useful in our daily planning that it tends to crowd out all other notions of time. Other notions of time are denigrated as less real. But other ways of measuring and, more importantly, experiencing time influence our decisions and emotions just as deeply as our clocks.

Nowhere is the experience of time more personal than in the act of hearing and making music. Music only exists in time. A sound may be heard in a single moment, but the grammar of a musical composition makes sense only if each present-tense sound is related to the sounds we have heard before, and thereby gives us expectations of what we might hear next.

Over three afternoons and evenings, the performers of the Boston Chamber Music Society along with panelists from music, the other arts, and the sciences, will be exploring how composers have used creative notions of musical time to produce works of striking beauty, invention, and craft. The panels focus on three important ways that music brings the concept of time to the forefront. First, the structure or architecture of a piece establishes ideas of time unique to that work. Second, musical works involve our sense of memory: composers invite us to remember earlier events in the same piece or they recall in us, either intentionally or inadvertently, other pieces we have already heard. Finally, time itself is often the subject of compositions, through their titles, their texts, or in the notation and directions to performers.

Each of the compositions chosen for this concert series exemplifies at least one of these three invocations of time. But no musical composition ever employs only one concept of time. Many are present in some form or another in every work and every concert. For that reason, we have not artificially broken down the accompanying panels so that each panel or each panelist will discuss one and only one application of time. Such strictness would inhibit the free flowing of ideas both among the panelists and between the panelists and the—we hope quite participatory—audience. Nonetheless, it seemed important here to define clearly and distinguish the three ideas of musical time that the panelists will be talking about, and in doing so show some of the intriguing ways the specific compositions on the concert use these concepts.

Time and the Structure of Music

Musical pieces can define their own measures of time, establishing them as constant and unyielding, so that, like the passage of time on a clock, we begin to trust the composer's definition of fixed time. Lulled into a false sense of security, we are deceived by the changes the composer

nearly always introduces. A masterful example of such a redefinition comes in the passacaglia of Ravel's Piano Trio. A passacaglia, like a chaconne, presents a repeated melody and harmony over which (or quite often in the music of Ravel, under which) new melodies and textures present a changing tableau: thus a blend of unity and variety. The repetitions of the passacaglia melody become markers of the passage of time. First the piano plays alone, then one "passacaglia" later (about thirty seconds in clock time) the cello and piano play, and then—after another passacaglia has passed—the violin takes over the cello's role.

Très large $\text{♩} = 40$
(violin tacet to [2])

Cello *pp*

Piano *pp*

Violin *p expressif*

p

Ravel, Piano Trio, "Passacaglia," second statement (cello and piano) transitioning to the third statement.

After establishing the passacaglia as a fundamental unit of musical time, Ravel begins to distort it. He does so subtly at first, by having the violin rush through the middle section of the melody and stretch the ending. His distortions then become more dramatic. An intense moment appears when the players begin playing the passacaglia melody and then a few seconds later jump back to the beginning, only to start the melody again at a higher pitch. Since Ravel has convinced his listeners to regard the passacaglia as a fundamental unit of time that inexorably advances, these jumps function almost as "time warps," and we become disoriented time travelers reliving experiences we have already had (though the new, higher pitch level reminds us that we have jumped to an alternate universe). As listeners today we have advantages in conceiving such time shifts over the listeners of Ravel's day. Not only science-fiction but also modern physics itself have espoused views of time as moldable, through real-relativistic concepts such as time dilation and space-time and through fanciful images such as tachyons and time-travel. Both the real and the fictional ideas have opened our imaginations toward sensing time as malleable, and it cannot help but improve our enjoyment of music.

Peter Child also uses changes of harmony to shift time in his string quartet named *Skyscraper Symphony*. Child jumps back and forth between two strikingly different chord groups: one based roughly around C-sharp minor, and another a complex superimposition of G minor and F major7. The two harmonic zones function like protagonists acting simultaneously in different spaces. Each time Child's music jumps between them, the listener catches up on what was happening in the other space. But as the music progresses, the jumps happen more and more rapidly, and the sense is one of time itself accelerating. The architecture of the piece resembles a house where every room along a long corridor is narrower than the one that came before.

Fast, Vigorous (♩=160)

9

17

sempre f

Child, *Skyscraper Symphony*, score reduction, mm 9–25

Courtesy of Peter Child. Used with permission.

Architectural analogies have long played essential roles in helping us understand musical structures (just as musical metaphors have aided architects). As Bruce Brubaker's notes in his contribution to the third panel, architecture and painting give us an opportunity to view "frozen music," that is, large structures displayed such that they can be seen in a single instant in a way music cannot be heard (except perhaps in our minds, and then only after the fact). In a famously provocative essay, the art historian Michael Fried described painting and sculpture's existence in a "continuous and perpetual present" as a state to which music aspires. We need not go so far as Fried and imply that there is a deficiency in music as an art form in order to acknowledge that there is something enticing about other arts' ability to be taken in at a moment. Yet because it cannot be heard at once, music (along with the other narrative arts) has a quality that the visual arts do not: the capacity to lead the audience through a shared journey, experienced together, yet perceived according to our individual internal clocks.

Not all sculpture lives in the unchanging present in the way Fried describes. The artistic inventions of Paul Matisse, a participant in the third panel, need time and sound to be experienced. His Memorial Bell at the National Japanese-American Memorial in Washington D.C. is an object of beauty, a gleaming eighteen-foot long tube that can be appreciated purely visually. But when a viewer pushes the lever to strike the bell with a hammer, suddenly the present disappears

and the sculpture expands to fill time: its sound can decay over several minutes on a quiet day. More well-known to MIT locals are the swaying pendulums of his “Pythagoras” sculpture, part of the *Kendall Band* in our eponymous subway stop. A collection of tubular bells and swinging hammers whose sway is controlled by riders waiting for the next train, the pure tones of the bells ring out in half-periodic/half-unpredictable cycles of time. The calm swaying of the hammers—sometimes reaching the next bell and sometimes coming up just short—also defines larger- and smaller-scale structures in time. Even when the roar of a train on the other track makes the bells almost inaudible, the ever-changing view of arms moving in precise proportion preserves the sculpture’s musical spirit.

The transformation of a visual artwork such as a painting or a sculpture into a musical piece raises difficult issues. Composers aim to preserve what is compelling or essential about the original, while not indenturing their compositions into a servitude of literal-minded depictions of each small element of the artwork. Such depictions could also be seen as a debasement of the original artwork by suggesting that it too can be fragmented into a set of individualized ideas to be observed in a fixed order.

William Grant Still’s *Suite for Violin and Piano*, based on three sculptures, skirts these pitfalls by using music to capture the ethos suggested by each artwork. For instance, the first movement, based on Richmond Barthe’s “African Dancer,” captures the exuberance of the original sculpture without reference to any specific African dance. (The medium of the works that inspired Still seems to be confused throughout the literature on the composer. His biography, partly written by his daughter, says that the artworks were paintings, while the notes to the recording of the *Suite* on New World Records suggests that “Mother and Child,” the artwork that inspired the second movement, was a lithograph. In fact, each of the pieces is the title of a well-known sculpture by artists best known as sculptors.)

Libby Larsen’s *Black Birds, Red Hills*, to be discussed in more depth below, transforms visual imagery that is itself musical in inspiration. She writes that her piece is inspired by the flow of time and color in six paintings by Georgia O’Keeffe. O’Keeffe was in turn inspired by the idea of taking music and “translating it into something for the eye.” In a sense, we have a double-translation from music to art and back again.



Though there are moments in films or plays where several scenes unfold at the same time, it is the medium of music that can most easily declare many ideas, often contradictory ones, simultaneously. As Ellen T. Harris discusses in her contribution to the third panel, time can be a layered structure in music. When multiple musical ideas are audible and independent, the effect can be of hearing two, three, or even four “minutes” worth of music within one minute of clock time. In instrumental music, the Baroque composers, and in particular Johann Sebastian Bach, are the most obvious masters of this layering of time. But we can find layered time handled just as exceptionally in the music of Hindemith, Palestrina, or, on the first concert, in the dense but spirited first movement of Andrew Imbrie’s *Serenade for Flute, Viola and Piano*. Although not notated as such, Imbrie often puts the three instruments in different meters with overlapping

tempos and accents. Playing with multiple speeds and multiple meters is not merely a twentieth-century phenomenon. Mozart used these techniques to invoke the mingling of different classes of music and of people. In his opera *Don Giovanni*, at one point three different dances in different meters sound simultaneously (usually played by spatially separated on-stage bands); in his Oboe Quartet, played on the third concert, Mozart has a similar, though more subtle moment in the last movement when the oboe takes a break from playing the bouncy and playful triple-time dance that the ensemble has been playing so far in order to play a common-time melody that (at least at its beginning) is more elegant and refined.



Courtesy of [Digital Mozart Edition](#), a project of Internationale Stiftung Mozarteum and The Packard Humanities Institute. Used with permission.

Mozart, *Oboe Quartet III*, mm. 93–98 (Neue Mozart Ausgabe).

Music is not the only art that structures itself in time, and indeed by studying how time shapes other arts we learn to hear music more perceptively as well. In theater, the passage of time can be marked by changes in many subtle and inventive ways. As Sara Brown (MIT's Director of Design) elaborates in her contribution, that just as a stage design can define the period in which a play exists, so can it also remove the audience's expectation that a theatrical work will develop along conventional ideas of time. Scenic design can even deny the expectation that a work will exist in any particular time at all. Like musical compositions, scenic design must work around practical considerations while defining time: set changes take (clock) time themselves, just as modulations and musical events do. In both music and theater different concepts of time co-exist, and it takes sophisticated composers, performers, and scenic designers to use these varied conceptions to their advantage.

Music and Memory

Just as essential to the success of a piece as its composer's control over the unfolding of time is her or his ability to evoke the memory of past musical experiences. The number of techniques for doing this is outnumbered only by the number of reasons why composers invoke the past. The most obvious way of bringing the past to the present is by repeating music from earlier in the piece. By doing so, composers establish immediate connections with a moment or moments in the past. These connections provide immediate and simple methods for unifying a composition, but more importantly they show how far (both in time and, metaphorically, in space) we have moved since we last heard this music. Beethoven, even in his early works such as the String Trio in E-flat major, was a master at using repetition to jog the memory of a past that seems distant

even though it was heard scarcely seconds before. Less than a minute into the piece, Beethoven jumps back to the beginning of the work, a rough and aggressive opening that is far removed from the gentler air that has appeared in the meantime. Yet Beethoven tweaks the listener's ear by introducing in the second statement a wrong note: a B-natural instead of a B-flat, reminding us that while the repetition was indeed meant to invoke the memory of a past time, what we are actually hearing is occurring right now on stage. Because he develops his themes so thoroughly and travels so far from where he begins, Beethoven's recapitulations—the parts of the piece where the music from the beginning is brought back, usually occurring about two-thirds of the way through a movement—are long awaited by his listeners. They are so longed for that, like his teacher Haydn, he often teases us with false, distorted recapitulations that just barely fail to recall the true memory of the opening theme. There are several of these false re-starts in the first movement of the String Trio, each more cunning than the previous.

(Not all repetition jogs the memory. In the minimalist compositions of composers such as Philip Glass and Steve Reich, the amount of repetition is so high and so immediate that the effect is less one of invoking memory and more about keeping the listener perpetually in the moment. It creates a different sort of “continuous present” from the one invoked earlier. Repetition prevents the material that was just played from disappearing into memory because that music is still being heard. Similar effects can be evoked in non-minimalist pieces by temporarily introducing a persistently repeated motive, called an ostinato, as Larsen does with the piano in the fourth movement of *Black Birds, Red Hills*.)

Though our understanding of the neurology of human memory as a whole is still vague, our knowledge of how the brain processes musical memory is much less known. Music theorists can guide us toward the right kinds of questions to ask about musical memories; questions whose answers will undoubtedly shape how we hear music. As Deborah Stein asks in her contribution to the second panel, how does having the memory of an earlier musical event compare to how we first heard that section? And what happens to our perception of the onward march of “real” time when we are experiencing a memory?

Just as importantly as recalling moments earlier in a piece, compositions can elicit memories of moments outside the piece. Quoting a pre-existing piece is perhaps the easiest way of triggering a mental shift backwards in time, either to the listener's memory of when the piece was new (when quoting a piece written recently) or farther back to our collective memory of the setting of an older composition. (Placing a quotation of Mozart within a modern composition can effectively evoke a “memory” of eighteenth-century Vienna even in listeners who know that time only through *Amadeus*.) This type of evocation is used effectively in much film music, as Martin Marks's second-panel discussion will illustrate.

For me (as an amateur clarinetist), the undulating clarinet solo near the beginning of Larsen's *Black Birds, Red Hills*, immediately evoked the memory of a similarly undulating clarinet solo in Igor Stravinsky's ballet *Petrushka*, also ending on an exposed high E. There is no reason why this connection should stick out in particular. There are other clarinet solos that end on the same note, and the similarities before this point are nothing out of the ordinary for any two pieces of music. There is certainly no reason why anyone else, even someone who knows *Petrushka* well,

should have this memory triggered at exactly this moment. But it is important when listening that we do remember other musical experiences. In fact, it is almost inevitable that any piece that holds our interest will bring out connections with music of the past. The active and individual memory of the listener has made writing music that is a clean break with the past so elusive.

(Even music that comes the closest to breaking with the past can succumb to a type of memory that the composer could never have intended. Some of the earliest, most serious, and most profound works for computer-generated sounds, such as Mario Davidovsky's *Synchronisms* series, have sections that, though highly original when they were premiered, for today's audiences recall music from the video games of the 1980s. The laughter that these sections elicit now has to be considered an ironic part of the aesthetic of the piece, otherwise the work no longer makes sense).

Finally, there are pieces that are less evocative of specific memories as they are of the process of remembering or, more accurately, of remembering only partially. These tend to be pieces that give only the fragment of a theme, or create an elusive sound world where specific pitches are hard to discern. The music of the twentieth-century composers Anton Webern and (in certain pieces) of György Ligeti comes to mind, but this technique is not only the provenance of European high modernism. The beginning and end of Schumann's song-cycle *Dichterliebe* have this quality, as do parts of the pieces by both the composers who will be joining us on these panels. The middle section of Peter Child's *Skyscraper Symphony* includes an extended section where the musicians play *tremolo sul ponticello*, that is, moving their bows rapidly back and forth on the bridge, a part of the instrument that anchors the strings, rather than playing in the normal method with long continuous strokes on the freely-vibrating sections of the strings. This method of playing (heard briefly also in the works on these concerts by Crumb and Foss, and as an effect of high tension in many soundtracks such as that of the television series *Lost*) disguises the melody in a miasma of scratchy noises and faint, high harmonics. What lines do come out are fractured and disconnected, like a memory barely recalled. Larsen's *Black Birds, Red Hills*, alludes in a quite different manner to the process of recalling. Although the first four movements, all similar in length, refer to specific memories of paintings by Georgia O'Keeffe, the last movement, not mentioned in Larsen's notes, is quite different. Titled "Looking..." (trailing off in evocative ellipses), the section is fragmentary and dreamlike in nearly every respect. It is extremely brief, lasting only about thirty seconds. Its melody is hinted at but never materializes; its harmony never becomes clear. As an audience, we try to make sense of the section, we try to anticipate what could come next by drawing connections to music from earlier in the piece, or from pieces we have heard before. But which pieces? Before we can answer that and before we can recall specific memories, the music ends. From the active listeners that such open-ended music demands that we become, we are suddenly transformed, through our applause, instead into active participants in the performance.

The image shows a musical score for Clarinet and Piano. The Clarinet part is in the upper staff, starting with a tempo marking of quarter note = 52. It begins with a fortissimo (ff) dynamic, followed by a 'quietly rit.' (ritardando) section marked piano (p). The Piano part is in the lower staff, also starting with quarter note = 52. It begins with ff, then moves to ppp (pianissimo) with a 'rit.' marking. The piano part features a complex, rhythmic accompaniment with many sixteenth notes. The score concludes with a piano (pp) dynamic and a key signature change to two flats.

Libby Larsen, "Looking..." from *Black Birds, Red Hills* (complete score; viola is silent)

Courtesy of Libby Larsen. Used with permission.

Time as Subject: Explicit invocations of Time in Composition

Given the importance of time in all aspects of musical composition, it comes as no surprise that composers are extremely conscious of how they wrestle with it, often making time an explicit subject of their compositions. The ways they invoke time can be subtle or crucially important. Some works include references to time in extra-musical elements such as titles or through poems and other texts about time. Or references can be woven into the score of pieces by unusual divisions of time. More explicit connections between clock time and musical time appear in works such as film scores that need to be precisely aligned to the passage of time on screen.

What is an explicit and original invocation of time in one period can become commonplace in another. We can take Beethoven's music as a prime example of how ideas toward time change, as Lewis Lockwood does in his contribution to the third panel. Beethoven was the first important composer to make use of the metronome, the new invention of the early nineteenth century in order to pass on to the performer specific indications of exactly how fast or slow a piece should be played. He used specific marks such as 132 quarter notes per minute. Today, such metronome markings are almost *de rigueur*, so their use would not indicate that the composer was taking a particular interest in how time was used. (Exceptions do exist, such as in Elliott Carter's Second String Quartet, and other recent works, where his tempo mark of 186.7 shows a fascination with time and proportion that goes beyond the norm. Another transformation of metronomes is in Ligeti's *Poème Symphonique* where 100 metronomes themselves become the instruments). Beethoven, Lockwood also notes, pursued instrumental pieces that were extremely long or extremely short for their era. Today, symphonies of over an hour or bagatelles of only a few seconds are not unusual, and would not be taken as specifically playing with time. But we do still take notice of works of extreme brevity or length, such as the Halberstadt version of John Cage's *As Slow As Possible* whose downbeat was given nine years ago, is still being performed, and is slated to finish in the year 2639.

Lukas Foss's *Time Cycle* is based on three poems and a prose diary, all concerning the passage of time. Foss, an American composer who died last year, chose several texts where time is quite explicitly the subject, in particular W. H. Auden's poem about the clock that measures our life. By contrast, the verse of A. E. Housman is more circumspect in its projection of time, merely alluding to the bells that "jostle in the tower." Foss's witty title refers not only to the cyclic nature of time but also to the genre at the heart of the piece, the song cycle. Foss's wit shows itself also in both audible and inaudible references to time in the score. The third line of

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Auden’s text begins, “Because we have no time.” After this text, Foss places a grand pause, that is, complete silence of indeterminate length that suggests a particular timelessness. The fourth song sets a section from Friedrich Nietzsche’s *Also sprach Zarathustra*. Nietzsche’s original text begins each line with a number, beginning with one and, like the hours on a clock, proceeding up through twelve. Foss chooses not to set these numbers, instead embedding them in code in the score. The piece ends with twelve identically-pitched strokes of an antique cymbal, an instrument that sounds like a high-pitched chime. The repeated pitches and the ringing character call to mind a tolling of church bells, but Foss spaces the chimes irregularly, distorting the character slightly. In the same movement, there is another invocation of the clock’s handing down of the hours from one to twelve, but this one is felt by the performers alone. In this song like in many of his pieces, Foss uses a musical style where a sense of fixed meter is barely, if at all, present. He writes most of the song in measures of 3/2 time, that is three slower (half-note) beats to every bar. However, interspersed at irregular intervals are single measures with faster, quarter-note beats. The first of these interruptions has a single beat, the second has two, and so on up to the final twelve-beat interruption. These measures are inaudible to the audience, but for the performer who must time his or her entrance perfectly, these measures must be counted silently but consciously in the head, “one, two, three...” creating an even stronger sense in the performers’ minds of the advancing of the clock.

The image shows a musical score for a vocal and piano piece. The vocal line is in 3/2 time and has the lyrics "als der tag ge - dacht." The piano accompaniment is in 3/2 time and includes various performance instructions such as "f espr.", "mp", "PPP", "arco", "pizz.", "Vib.", "p", "p dolce", and "non espr. ma legatiss.". The score shows a metrical interruption where the time signature changes from 3/2 to 2/4 and back to 3/2.

Foss, *Time Cycle*, IV, excerpt including seventh metrical interruption

Courtesy of Carl Fischer Music. Used with permission.

This type of musical effect that exists only for the performer—often called by the German term *Augenmusik* or “eye-music”—is prevalent in the scores of George Crumb, a living American composer represented on the first concert by his piece *Eleven Echoes of Autumn*, 1965 written in the following year, 1966. Like the work by Foss, *Eleven Echoes* contains both a title and a text explicitly dealing with time: here a quotation from Federico García Lorca, “y los arcos rotos donde sufre el tiempo” (“and the broken arches where time suffers”). Unlike Foss’s songs which were sung by a professional singer, here the words are spoken by the instrumentalists in stage-whispers, as if the words are distant memories.

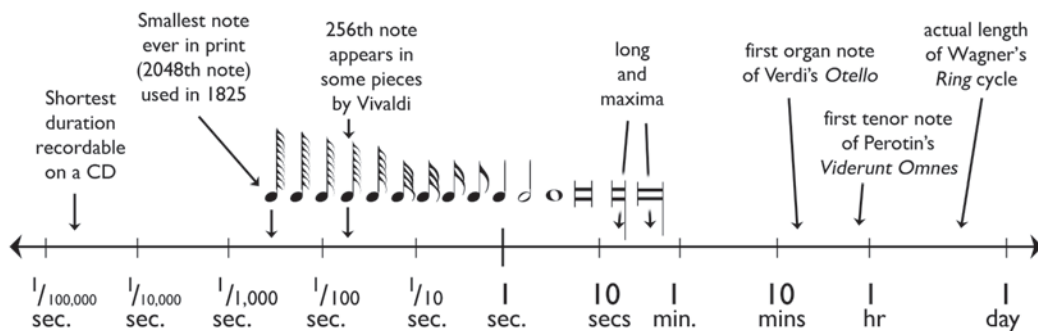
Are poetic invocations of time inherently musical? What remains after Foss, or Crumb, or Loeffler (whose *Two Rhapsodies* are based on poems by Maurice Rollinat) translate poetic time into musical time? How do poems themselves, even those that are not explicitly about time, structure time in a musical manner? The poet Stephen Tapscott will add to these queries in the third panel both by contributing original poems on the topic of time and by discussing the interconnected effects of time, poetry, and music.

Whispering voices are not the only sounds atypical for chamber-music found in Crumb's *Eleven Echoes*. A striking quality in his compositions is the unusual sound effects he draws out of the instruments. Violins are played like mandolins. Flutists sing while playing. Rubber erasers are tugged across a piano's strings creating a shimmering, whistle-like effect. The clarinet plays into the sounding board of the piano, adding an otherworldly resonance. But performers see another aspect of Crumb's creative spirit: the unusual and beautiful notation that he uses, quite often to bring out subtle nuances in the depiction of time. He writes his music using extremely short note values, such as 128th notes, notes so conceptually small that 32 of them fit into the conventional beat of the quarter-note. His string quartet *Black Angels* (performed by BCMS in Boston and Cambridge a few years back) has a passage where the beat is the shortest duration ever published, 7/128 time. Is his music extremely fast then? No, not really. Crumb often uses tempos that are so slow that they completely negate the speed otherwise implied by such small notes. He creates a cognitive dissonance between seeing fast-looking notes and dramatically reining in the beat. This tension comes through in the sound, creating a more uncomfortable, edgy performance that is palpable in almost all of Crumb's works.

The usage of extreme notation is also important to the study of time in music because it continues a long trend of music's fundamental beat becoming slower and slower. This trend first appeared in Paris of the 1200s and has continued throughout the better part of a millennium in notated music of the West. The standard durations used in most pieces of classical music today are whole notes, half notes, quarter notes, eighth notes, and sixteenth notes. But there are others, including smaller notes such as thirty-second notes and, less commonly, longer notes. The uncommon double-whole note (written as H or $\text{||}\text{O}$) is also called a "breve," meaning short or brief. Why is a note so long called "short"? It is because it used to be performed as a fast note. And there were even longer notes. The West's earliest rhythmically notated music, that attributed to two composers in the Cathedral of Notre Dame of Paris, Leonin and Perotin, used two fundamental note values, the breve and the long, which was equivalent to two or three breves. In other words, a long was 16 or 24 quarter notes. To this was added the double or duplex long (32 or 48 quarter notes) also known as the maxima, that is, the longest measurable note. Longer notes did exist, but like the fermatas or holds that end many pieces to this day, they were not precisely measured. By the mid-thirteenth century the main trend was towards slower tempos, and with them shorter notes. The most important innovation was the introduction of a note half the length of the breve, called the semibreve. This word is still the most common name in Britain for the note that in the States is called the whole note. (American note names are literal translations of terms from Germany, the place where many nineteenth-century American composers received their musical training). By the fourteenth century, the tempo of music had slowed sufficiently that a note even faster than the semibreve needed to be introduced. This note came to be called the minima or minim—still the British word for half note—signifying that this was to be the minimum, that

is, the final and smallest possible note. But the force of the trend was unstoppable: it was less than fifty years later that the first “semiminim” would appear.

Between Leonin and Crumb, there exists a range of time that is almost incomprehensible to our sense of how music unfolds. Within a single maxima, there are 1024 128^{th} notes, and some rare pieces of music contain even more extreme notes. The following example shows (on a logarithmic scale) the length of various notes if they were all played at the same adagio tempo of quarter note = 60, or one beat per second.



Lengths of different note values at M.M. qtr. = 60.
 (with actual CD frequency and Ring lengths for reference)
 Some information courtesy of Donald Byrd.

From 2048th notes to Verdi’s opening organ pedal in *Otello* there is an incredible range. Perhaps thankfully, none of the pieces in this festival exploit this entire range of possibilities. But the rhythms of time used in the natural world encompasses a far greater span. If the range of musical time expressed in the written notes stretches our sense of experience, the rhythms of the universe far exceed what we can hope to grasp intuitively. As MIT physicist Robert Jaffe discusses in his contribution to the first panel, the fundamental work in physics has shifted to the extremes of time—fractions of seconds so short they take over 40 zeros to write, or scales on the order of billions of years or more. (Like the Italians of the fourteenth century with their minima, modern physics also has its concept of a smallest possible time value, and debates about whether time moves in discrete quantities remain the basis for scientific articles, as they did with musical time in the Middle Ages). Grasping such tiny and gargantuan time scales can fundamentally alter how we perceive the world around us, and perhaps in the process how we listen to music.



But we have been sidetracked from Crumb’s intriguing and explicit invocations of time. In many pieces, Crumb invokes new ideas of musical time through his notation, most unusually by writing musical passages in the shape of circles. In some pieces he uses the circle to represent repeating cycles, especially cycles of music that repeat in cycles independent from those of performers playing music written outside the circle.

Cadenza III (very free)

Alto Flute and Piano
begin circle-music
(Quasi meccanico)

7

Eco 7. Dark, intense [♩ = 52]

lunga gradual change to breathy tone whispered: don-desu-fre el tiem-po. al niente

fz pp sub. non vibr. attacca subito

Quasi meccanico [♩ = 146]

Alto Flute

Piano

Actual sounds:

rapid gliss. over strings (come sopra)

on the keys

touch strings at 5th partial note

P.I. (sempre)

Begin circle at cue (v) in Clarinet cadenza (sempre sim.)

the Clarinetist should finish shortly before the circle-music is completed.

Attacca subito Eco 8

Pianist N.B. - There should be absolutely no break between Eco 7 and Eco 8. The 32nd note figure should be regarded as an upbeat to the first chord of Eco 8.

Crumb, *Eleven Echoes of Autumn*, 1965, Eco 7

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In *Eleven Echoes of Autumn, 1965*, the circles exist to emphasize the disjunction between the measured, rhythmic music played by the piano (and other instruments that occasionally join the circle music) and the free, improvisational-sounding music of a solo instrument playing its own cadenza. It would be entirely possible to notate this music without a circle. The two parts could be lined up on top of each other with an indication to play freely or to ignore the other players. Such markings exist in sections of many conventionally notated pieces by other composers. But musicians' training and the conventions of notation prevent such sections from sounding truly independent and free. Crumb's beautiful and unusual scores, though more difficult to read initially, help performers discard their ingrained ideas of the coordination of time.

Being as it is so fundamental to so much musical expression and development, there is no way that three categories, Structure, Memory, and Subject can begin to encompass the all the creative uses of time in music by composers as diverse as Beethoven and Child, Larsen and Loeffler, or Imbrie and Ravel. Over the month of January, through both panels and performances, we hope that there is time to explore the many other paths and directions in which thinking about our experiences with time in music will lead us.

[Note: The portions of this essay dealing with the overall slowing of musical time over the last millennium will be published in expanded form as Michael Scott Cuthbert, "Changing Musical Time at the Beginning of the Renaissance (and Today)," in *Renaissance Studies in Honor of Joseph Connors* (Firenze: Olschki, 2011), edited by Louis A. Waldman and Machtelt Israëls.]

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